RELATION OF THE ORCHID FLORA OF AUSTRALIA TO THAT OF NEW ZEALAND.

WITH THE DESCRIPTION OF A NEW MONOTYPIC GENUS FOR NEW ZEALAND.

By H. M. R Rupp, B.A., Sydney, N.S.W., and E. D. Hatch, Auckland, N.Z.

[Read 27th June, 1945.]

This paper may be conveniently divided into the following sections:

I. A general survey of the orchid genera of both countries, with certain data in regard to their distribution.
II. The probable origin of these genera.
III. Orchid species common to Australia and New Zealand.
IV. Possible explanations of the close relation existing between the two orchid floras.
V. The description of a new monotypic orchid genus for New Zealand.

I. General Survey.

To the student of orchidology, the relation between the orchid flora of Australia and that of New Zealand is so striking, and in some respects so remarkable, that a survey of the subject seems long overdue. The present attempt to provide this can scarcely be regarded as more than preliminary, but the authors are hopeful that it may at least clear up some obscurities, and pave the way for other workers who may be able to reach satisfactory conclusions as new light is thrown upon the subject in the course of time.

The figures given below, in connection with the numbers of orchid genera and species, must be taken as approximate only. They are as nearly correct as it is possible for us to make them at the time of writing. But no comprehensive census nor catalogue is available, including every genus and species effectively published for Australia and New Zealand up to the present time; and so far as Australian orchids are concerned, descriptions of new species have been published in so many different journals (not all of them Australian), that it is possible we have missed a few. We have been as accurate as our sources of information permitted.

(*a*). *The Orchid Flora of Australia.*—This is distributed among 71 genera, containing about 470 known species. The number will probably be substantially increased before a comprehensive census becomes possible; new species are being added every year, and comparatively little is known as yet of the orchids of the tropics between the north-west of Western Australia and the Cape York Peninsula. In the table which follows, the number of known species each of the six Australian States is given, with an extra column for the Northern Territory.

Genus.	Number of Known Species.						
	Qd.	N.S.W.	Vict.	Tasm.	S. Aust.	W. Aust.	N.T.
Habenaria, L.	8						9
Thelymitra, Forst.	2	12	22	10	16	20	
Epiblema, R.Br.						1	
Diuris, Sm.	9	29	11	7	8	7	
Orthoceras, R.Br.	1	1	1	1	1		
Microtis, R.Br.	2	4	5	4	4	9	
Goadbyella, Rogers						1	
Corunastylis, Fitzg.		1					
Prasophyllum, R.Br.	9	44	27	14	13	18	
Caleana, R.Br.	2	3	3	2	2	1	
Spiculaea, Lindl.	1	2	2			1	
Drakaea, Lindl.						4	

Genus.	Number of Known Species. Qd.	N.S.W.	Vict.	Tasm.	S. Aust.	W. Aust.	N.T.
Chiloglottis, R.Br.	1	5	5	4			
Acianthus, R.Br.	5	4	3	3	3	2	
Townsonia, Cheesmn.				1			
Eriochilus, R.Br.	1	1	1	1	1	4	
Leptoceras, Lindl.			1		1	1	
Calochilus, R.Br.	3	5	5	4	3	1	1
Rimacola, Rupp		1					
Lyperanthus, R.Br.	1	2	2	2	1	3	
Burnettia, Lindl.		1	1	1			
Caladenia, R.Br.	7	24	28	16	18	43	
Adenochilus, Hook. f.		1					
Glossodia, R.Br.	2	2	2	1	1	3	
Corybas, Salisb.	4	7	5	5	3	1	
Nervilia, Comm. ex Gaud.	4						
Didymoplexis, Griff.							1
Cryptostylis, R.Br.	2	3	4	1	1	1	
Pterostylis, R.Br.	20	38	33	23	21	14	
Galeola, Lour.	2	2					
Epipogum, Gmel.	1	1					
Gastrodia, R.Br.	1	1	1	1	1		
Rhizanthella, Rogers						1	
Cryptanthemis, Rupp		1					
Spiranthes, Rich.	1	1	1	1	1		
Zeuxine, Lindl.	2	1					
Anaectochilus, Blume	1						
Goodyera, R.Br.	2						
Corymborchis, Thou.	1						
Hetaeria, Blume	1						
Cheirostylis, Blume	1						
Microstylis, Nutt.	1						
Liparis, Rich.	9	4					
Oberonia, Lindl.	2	2					
Phaius, Lour.	2	1					
Calanthe, R.Br.	1	1					
Spathoglottis, Blume	2						
Pholidota, Lindl.	1						
Geodorum, Jacks.	2	1					
Eulophia, R.Br.	3						1
Cadetia, Gaud.	2						
Dendrobium, Sw.	50	17	2	1		1	6
Eria, Lindl.	3						
Phreatia, Lindl.	2						
Pachystoma, Blume							1
Bulbophyllum, Thou.	16	8					
Dipodium, R.Br.	3	2	1	1	1		1
Cymbidium, Sw.	4	3					2
Luisia, Gaud.	1						
Phalaenopsis, Blume	1						
Sarcanthus, Lindl.	4	3	1				
Camarotis, Lindl.	1						
Schoenorchis, Schltr.	1						
Drymoanthus, Nich.	1						
Saccolabium, Blume	3						
Vanda, Jones.							1
Ornithochilus, Wall.	1	1					
Taeniophyllum, Blume	1	1					
Sarcochilus, R.Br.	13	12	2	1			
Chiloschista, Lindl.	1						1
Thrixspermum, Lour.	2						

Of these seventy-one genera, only thirteen appear to be strictly endemic, viz.:

Epiblema.	*Drakaea.*	*Rimacola.*	*Rhizanthella.*
Goadbyella.	*Eriochilus.*	*Burnettia.*	*Cryptanthemis.*
Corunastylis.	*Leptoceras.*	*Glossodia.*	*Drymoanthus.*
Spiculaea.			

Nine of the endemic genera are monotypic. The exceptions are *Spiculaea* (3 species), *Drakaea* (4 species), *Eriochilus* (5 species), and *Glossodia* (5 species).

(*b*) *The Orchid Flora of New Zealand.*—In Cheeseman's *Manual of the N.Z. Flora* (1925 ed.), p. 331, the orchids are distributed among twenty-two genera. One of these, *Cyrtostylis* R.Br., is now absorbed into *Acianthus* R.Br.; but the number will remain the same, as the genus *Aporostylis*, n. gen., described in section V of this paper, must be added. In the table of distribution which follows, four geographic areas are recognized, and are indicated by abbreviations thus: N.I., North Island; S.I., South Island; Stewart, Stewart Island; and Sub-ant., the sub-antarctic Auckland, Campbell, Chatham, and other groups.

Genus.	Number of Known Species. N.I.	S.I.	Stewart.	Sub-ant.
Thelymitra	14	3	2	2
Orthoceras	1	1		
Microtis	1	1		
Prasophyllum	5	2	1	1
Caleana	1			
Chiloglottis	2	1	1	1
Aporostylis, n. gen.	1	1	1	1
Acianthus	2	2		
Townsonia		1		
Calochilus	3	1		
Lyperanthus	1	1	1	1
Caladenia	1	2	1	1
Petalochilus Rogers.	2			
Adenochilus	1	1		
Corybas	7	5	4	2
Pterostylis	12	9	3	2
Gastrodia	2	3	1	1
Spiranthes	1	1		
Earina Lindl.	3	2	2	1
Dendrobium	1	1	1	
Bulbophyllum	2	2		
Sarcochilus	1	1	1	1

It will be observed that of these genera, only three—*Aporostylis*, *Petalochilus* and *Earina*—are not in the preceding table of Australian genera. The first two are endemic in New Zealand, with one and two species respectively. *Earina* will be mentioned again in section II. It is surely obvious from a comparison of the tabulated orchid genera of the two countries that a close relationship exists; and the evidence for it becomes still clearer as we discover how large a proportion of the New Zealand orchid *species* are actually identical with Australian species. This will form the subject-matter of section III.

II. The Probable Origin of Australian and New Zealand Orchid Genera.

We think it necessary to preface our remarks on this subject by stating that, broadly speaking, we accept the conclusions of Cockayne and Marshall in regard to the geological and geographical history of the distribution of land-masses in the south-west Pacific. This means that we reject the theory of any direct land-connection between Australia and New Zealand later than early or middle Mesozoic time. To put it in Marshall's words, we believe that "New Zealand has been separate from Australia at least for the period that has elapsed since that continent received its reptilian, amphibian, insect and mammalian fauna and the characteristic flora". (*Rep. Aust. and N.Z. Ass. Adv. Sci.*, Sydney, 1932, p. 411.) Therefore, though from an orchidological point of view there would seem to be quite a substantial amount of circumstantial evidence favouring the theory of a land connection across the Tasman Sea during the above period, we think that the facts relevant to our subject are better explained on the hypothesis of an extensive antarctic continent in early Cretaceous time (see Cockayne, *Veget. of N.Z.*, 1928, p. 422 et seq.).

Excluding the thirteen endemic Australian genera specified in section I, we have fifty-eight non-endemic Australian genera. In 1923 Rogers (*Trans. Roy. Soc. S. Aust.*,

xlvii, p. 331) gave the following as true generic types originating in Australia, but not endemic:

Calochilus.	*Pterostylis.*	*Cyrtostylis.*
Thelymitra.	*Caleana*	*Caladenia.*
Orthoceras.	*Acianthus.*	*Adenochilus.*
Prasophyllum.	*Lyperanthus.*	*Chiloglottis.*
Microtis.		

If we substitute *Townsonia* for the now obsolete genus *Cyrtostylis*, the number remains the same in this list. But a careful study of the distribution of the species comprising these genera reveals difficulties in the way of accepting an Australian origin for all. It appears to us far more likely that some of the genera, or their ancestral forms, originated in the antarctic (Palaeozelandic) continent already alluded to. This continent is believed to have extended northward to include the land-masses now represented by New Zealand and its small island dependencies, and also Lord Howe Island, and, less certainly, Norfolk Island; from Lord Howe Island there was an extension to New Caledonia, Melanesia and New Guinea, with a probable land-connection there to Australia. Further west the Palaeozelandic continent threw out another northern extension to what is now Tasmania, which was then in direct land-connection with the south of Australia. The development and distribution of the following orchid genera lead us to regard them as having had their origins in this Palaeozelandic continent, whence they spread northward to New Zealand and in some instances beyond it, and also through the Tasmanian extension to the mainland of Australia:

Thelymitra.	*Lyperanthus.*	*Caladenia.*
Chiloglottis.	*Townsonia.*	*Pterostylis.*

We agree, with certain reservations, that the remaining genera—*Diuris*, *Orthoceras*, *Microtis*, *Prasophyllum*, *Caleana*, *Calochilus*, *Acianthus* and *Adenochilus*—may be considered as probably of Australian origin, though not endemic there. The reservations concern *Microtis*, which is represented by one or two species over a large area of eastern Asia, and may conceivably have had an Asiatic origin; *Acianthus*, the remarkable development of which in New Caledonia (thirteen species) seems to require explanation if the genus was originally Australian; and *Adenochilus*, which may possibly have been Palaeozelandic. With regard to the monotypic genus *Townsonia* (see also section III), it would appear that its progress beyond Tasmania was arrested by the formation of Bass Strait.

Eliminating, then, the Australian endemic genera (13), the genera here admitted as of Australian origin though not now endemic (8), and those we regard as of Palaeozelandic origin (6), there still remain forty-four genera of Australian orchids to be accounted for. According to Rogers (Presidential Address, Botany Section, *Rep. Aust. and N.Z. Ass. Adv. Sci.*, Sydney, 1932, p. 339), in the great majority of instances these can be traced back through New Guinea or the Malay Archipelago, into the continent of Asia proper. They may be considered as of Asiatic or other origin, or at least it may be confidently affirmed that they did not originate in the south-west Pacific. They are as follows:

Habenaria.	*Goodyera.*	*Geodorum.*	*Phalaenopsis.*
Corybas.	*Corymborchis.*	*Eulophia.*	*Sarcanthus.*
Nervilia.	*Hetaeria.*	*Cadetia.*	*Camarotis.*
Didymoplexis.	*Cheirostylis.*	*Dendrobium.*	*Schoenorchis.*
Cryptostylis.	*Microstylis.*	*Eria.*	*Saccolabium.*
Galeola.	*Liparis.*	*Phreatia.*	*Vanda.*
Epipogum.	*Oberonia.*	*Pachystoma.*	*Ornithochilus.*
Gastrodia.	*Phaius.*	*Bulbophyllum.*	*Taeniophyllum.*
Spiranthes.	*Calanthe.*	*Dipodium.*	*Sarcochilus.*
Zeuxine.	*Spathoglottis.*	*Cymbidium.*	*Chiloschista.*
Anaectochilus.	*Pholidota.*	*Luisia.*	*Thrixspermum.*

Turning now to the New Zealand genera, we find that all but three—*Earina*, *Aporostylis* and *Petalochilus*—are already accounted for in the foregoing lists. The Asiatic element, which probably came over the Palaeozelandic continent *via* New Caledonia, is small:

Corybas.	*Spiranthes.*	*Bulbophyllum.*
Gastrodia.	*Dendrobium.*	*Sarcochilus.*

Genera of Australian origin:

Orthoceras.	*Caleana.*	*Calochilus.*
Microtis?	*Acianthus.*	*Adenochilus?*
Prasophyllum.		

Possibly *Adenochilus* should be transferred to the next list. There is one species in New Zealand and one in Australia, and they may have developed from a common Palaeozelandic ancestral form.

Genera of Palaeozelandic origin:

Thelymitra.	*Lyperanthus.*	*Caladenia.*
Aporostylis.	*Townsonia.*	*Pterostylis.*
Chiloglottis.		

The genus *Earina* presents some difficulties. There are three species in New Zealand, and others occur in New Caledonia, Fiji, and other south Pacific Islands; but the genus is not represented either in Australia or Indo-Malaya. It may have developed in the Palaeozelandic continent after the severance of Tasmania from the latter; but it is not impossible that it is of Polynesian origin. With regard to the two endemic genera *Aporostylis* and *Petalochilus*, the former is sufficiently dealt with in section V, while *Petalochilus* is a somewhat anomalous genus very closely allied to *Caladenia*, but entirely lacking the labellar glands so characteristic of the latter. It appears to be strictly a "local development" for the only two species discovered are confined to a very small area in the extreme north of the North Island.

This is a suitable place for a note on the orchids of Lord Howe and Norfolk Islands, both of which lie between Australia and New Zealand. On Lord Howe Island there is one Australian species of *Dendrobium* (*D. gracilicaule* F. Muell. var. *Howeanum* Maiden), one endemic species of the same genus (*D. Moorei* F. Muell.), one New Zealand species of *Bulbophyllum* (*B. tuberculatum* Col.), one endemic species of *Sarcanthus* (*S. erectus* (R. D. Fitzg.) Rupp), and one species of *Microtis* (*M. unifolia* (Forst.) Reichb. f.). Thus there are connecting links here with both Australia and New Zealand. On Norfolk Island, however, with the exception of the ubiquitous *Microtis unifolia*, the orchid flora is entirely endemic, consisting of two species of *Dendrobium* (*D. brachypus* Reichb. f. and *D. macropus* Benth. & Hook. f.), one species of *Bulbophyllum* (*B. argyropus* Reichb. f.), and one of *Phreatia* (*P. obtusa* Schltr.). If then Norfolk Island was originally part of the Palaeozelandic continent, the development of its orchid flora suggests that it became isolated at a very early period. In both islands the presence of *Microtis unifolia* might be explained by seeds carried by wind or birds from Australia, where this orchid is very common.

III. Orchid Species common to Australia and New Zealand.

In 1932, Rogers (l.c., p. 341) put the number of these at twenty, with two others doubtful. Our own investigations have increased the number to twenty-eight, with four others sufficiently doubtful to require further study when fresh material is available on both sides of the Tasman Sea.*

These conspecific orchids may be conveniently dealt with under two divisions, viz.: Those which we regard as entirely identical except for such slight and unimportant variations as occur in all plant species (Table A) and those which, although specifically identical, show sufficient constant variation from the type to be ranked as named varieties (Table B).

In tabulating the species in Table A, we give in the first column the valid name of each species, and in the second column the synonyms in those cases where it has been

* Since the completion of this paper, further investigation has conviced us that three more species must be added to the list of those which are common to both countries. The New Zealand *Corysanthes Matthewsii* Cheesmn. is undoubtedly conspecific with the Australian *Corybas unguiculatus* (R. Br.) Reichb. f., and should be known in future by the latter name. On the other hand, the Australian *Chiloglottis Muelleri* R. D. Fitzg. and *Caladenia alpina* Rogers are conspecific respectively with the New Zealand *Chiloglottis cornuta* Hook. f. and *Caladenia Lyallii* Hook. f. Our opinion in regard to these has been fully endorsed by Messrs. J. H. Willis of the Victorian National Herbarium, and W. H. Nicholls, Hon. Curator of the Melbourne University Herbarium. The name *Corysanthes Matthewsii* therefore becomes a synonym of *Corybas unguiculatus*; the name *Chiloglottis Muelleri* a synonym of *C. cornuta*; and the name *Caladenia alpina* a synonym of *C. Lyallii*.

necessary to restore the valid name. Further information on such cases will be found in the notes which follow Table B.

TABLE A.

Valid Name.	Synonymy.
Thelymitra ixioides Sw.	
longifolia Forst.	
aristata Lindl.	
pauciflora R.Br.	
venosa R.Br.	
Matthewsii Cheesmn.	*T. D'Altonii* Rogers.
Orthoceras strictum R.Br.	
Microtis unifolia (Forst.) Reichb. f.	
Prasophyllum patens R.Br.	
Rogersii Rupp	
Caleana minor R.Br.	
Chiloglottis formicifera Fitzg.	
Calochilus Robertsonii Benth.	*C. campestris* sensu Cheesmn., non R.Br. (see note 4 below).
paludosus R.Br.	
Townsonia viridis (Hook. f.) Schltr.	*Acianthus viridis* Hook. f.: *Townsonia deflexa* Cheesmn.
Corybas aconitiflorus Salisb.	*Corysanthes Cheesemanii* Hook. f. ex T. Kirk.
Pterostylis nutans R.Br.	*P. Matthewsii* Cheesmn.
nana R.Br.	*puberula* Hook. f.
furcata Lindl.	*micromega* Hook. f.
foliata Hook. f.	*gracilis* Nich.
mutica R.Br.	
barbata Lindl.	
Gastrodia sesamoides R.Br.	
Spiranthes sinensis (Pers.) Ames	*S. australis* Lindl.

TABLE B.

Named varieties.

Valid Name.	Synonymy.
Caladenia carnea R.Br. var. *pygmaea* Rogers	*Caladenia minor* Hook. f.
carnea R.Br. var. *exigua* (Cheesmn.) Rupp	*Caladenia exigua* Cheesmn.
Thelymitra carnea R.Br. var. *imberbis* (Hook. f.) Rupp and Hatch	*Thelymitra imberbis* Hook. f.
Acianthus reniformis (R.Br.) Schltr. var. *oblongus* (Hook. f.) Rupp and Hatch	*Cyrtostylis oblonga* Hook. f.

It would not be profitable to discuss here the four doubtful species alluded to above. But some notes on the changes of nomenclature involved in the foregoing tabulation are desirable, and in a few instances we briefly comment where no change of name has been necessary.

1. *Thelymitra Matthewsii* Cheesmn.—In 1930 Rogers (*Trans. Roy. Soc. S. Aust.*, liv, p. 42) described a species of *Thelymitra* from the Victorian Grampians under the name *T. D'Altonii*, which was subsequently found in eastern Victoria also. At it became better known, its resemblance to the New Zealand *T. Matthewsii* was generally recognized; and Nicholls (*Vict. Nat.*, lvii, 1940, p. 83) records *T. D'Altonii* as a synonym only.

2. *Prasophyllum Rogersii* Rupp.—This was described as a new species from the plateau of Barrington Tops, N.S.W. (these PROCEEDINGS, liii, 1928, p. 340). Shortly afterwards the author received specimens from the late H. B. Matthews of a *Prasophyllum* collected at Kaitaia, N.Z., which he determined as identical with his Barrington Tops species. It has subsequently been found near Hobart (A. M. Olsen), and, according to a personal communication from W. H. Nicholls, in the far east of Victoria.

3. *Chiloglottis formicifera* Fitzg.—To anyone familiar with the habitat of this comparatively rare species in Australia (where it is restricted to a limited area in New South Wales), its occurrence in New Zealand is very puzzling. This will be discussed further in section IV.

4. *Calochilus Robertsonii* Benth.—Cheeseman (*Manual of N.Z. Flora*, p. 357), in recording for New Zealand what he took to be *C. campestris* R.Br., stated that specimens exactly matched R. D. Fitzgerald's plate in *Aust. Orch.*, i (4), 1878. But Fitzgerald was mistaken in his interpretation of the species; the plant he depicts as *C. campestris* is

not that species at all, but the pale-flowered form of *C. Robertsonii* (see Rupp, these PROCEEDINGS, lxix, 1944, p. 277). In Rupp's herbarium there are typical specimens of *C. Robertsonii* collected by H. B. Matthews at Rotorua. An admirable plate of *C. campestris* may be seen in *Bot. Mag.*, 1832, t. 3187. In our opinion this species has not been found in New Zealand.

5. *Townsonia viridis* (Hook. f.) Schltr.—In Vol. ii of his *Flora Tasmaniae*, 1850, under "Additions and Corrections", Hooker described a small orchid of mountain gullies as *Acianthus viridis*. In the 1906 edition of Cheeseman's *Manual of N.Z. Flora*, the author created a new genus, *Townsonia*, the single species being named *T. deflexa* (p. 692). Schlechter (*Fedde, Repert.*, ix, 1911, p. 249) transferred Hooker's *Acianthus viridis* to *Townsonia*. Rupp (*Vict. Nat.*, l, 1933, p. 18) discussed and illustrated both plants, expressing the opinion that they were conspecific. We are now completely satisfied that this view is correct. It seems a pity that the name of the author of this monotypic genus should be excluded from the valid nomenclature of the species; but according to international rules it must stand as *T. viridis* (Hook. f.) Schltr.

6. *Corybas aconitiflorus* Salisb.—There is no doubt that, as Cheeseman himself hinted (*Manual of N.Z. Flora*, p. 364), *Corysanthes Cheesemanii* Hook. f. ex Kirk is identical with *C. bicalcarata* R.Br. Since the International Council for Nomenclature decided against the conservation of Brown's nomenclature, that of Salisbury must be adopted (see Rupp, *Vict. Nat.*, lix, 1942, p. 60).

7, 8. *Pterostylis nutans* R.Br.; *Pterostylis nana* R.Br.—There can be no doubt that these are the valid names respectively for *P. Matthewsii* Cheesmn. and *P. puberula* Hook. f.

9. *Pterostylis furcata* Lindl.—We have very carefully compared specimens of this with *P. micromega* Hook. f. The latter appears to have slightly more acute sepals and petals; otherwise they agree perfectly, and should be regarded as conspecific.

10. *Pterostylis foliata* Hook. f.—Nicholls (*Vict. Nat.*, xliii (11), 1927, p. 324) described a *Pterostylis* found in Victoria and Tasmania as *P. gracilis*. It has since been recognized as identical with *P. foliata* Hook. f., though we have been unable to trace any previous publication of the identity.

11, 12. *Caladenia carnea* R.Br. var. *pygmaea* Rogers, and var. *exigua* Cheesmn.—Rupp (these PROCEEDINGS, lxix, 1944, p. 74) reduced the New Zealand *C. minor* Hook and *C. exigua* Cheesmn. to the above varieties of *C. carnea*. Since then, additional material of *C. carnea* var. *pygmaea* has raised some doubt as to whether it would not have been better to retain Hooker's name as that of a distinct variety. But even the varieties of *C. carnea* are themselves so liable to vary, that for the present at all events we think it best to let the matter rest. We feel no doubt that both the New Zealand forms really belong to *C. carnea*, and both can be matched freely in Australia.

13. *Thelymitra carnea* R.Br. var. *imberbis* (Hook. f.) Rupp and Hatch.—We have reduced Hooker's *T. imberbis* to varietal rank with some hesitation. Specimens in Rupp's herbarium received from H. B. Matthews are more robust than any form of *T. carnea* he has seen, and the column is stouter. But the morphology of the flowers is almost identical, and there does not seem to be any distinction warranting specific separation.

14. *Acianthus reniformis* (R.Br.) Schltr. var. *oblongus* (Hook. f.) Rupp and Hatch.—The New Zealand plant seems consistently more diminutive than the typical form of *A. reniformis*, but apart from this and the oblong leaf we can find nothing to distinguish them. Hatch is convinced that Cheeseman was right in sinking *C. rotundifolia* Hook f. (*Manual of N.Z. Flora*, p. 356). In the Australian plant the leaf is by no means always reniform, but is often orbicular or even cordiform.

IV. Possible Explanations of the Close Relation existing between the Orchid Floras of Australia and New Zealand.

The fact of this relation will have been made abundantly clear in the foregoing sections of this paper. Various explanations have been offered for it. The hypothesis of a primeval antarctic continent, to which we expressed our adherence in section II, explains much, but it certainly does not explain everything. It provides a rational

explanation for the development of such genera as *Thelymitra* and *Pterostylis* along similar lines in both countries; and if certain species were in process of being evolved into their present forms when the Palaeozelandic continent was broken up, no one can assert that there was anything in the new conditions to prevent the continuance of their development into identical forms. But if ancestral forms of *Caladenia* were also included in the Palaeozelandic orchid flora, why did they develop with such remarkable richness of colouring and great variety of form on the Australian side, and so poorly on the New Zealand side? Take the case of another genus—*Chiloglottis*. A common ancestral form in the ancient continent might well develop into *C. cornuta* in New Zealand, and into *C. Gunnii*, *C. Muelleri*, and perhaps *C. Pescottiana* in Australia; their close affinity is obvious. But we cannot believe that in the far north of New Zealand they would evolve so different a form as *C. formicifera*, completely identical with a relatively rare New South Wales species. We have much to learn yet. This particular species is of special interest. In Australia it occurs, nowhere in great abundance, but in considerable "colonies", from the Hunter River on the north to the Shoalhaven River on the south. It inhabits well-shaded forest gullies. How did it reach New Zealand? Was the seed carried across the 1,200 miles of the Tasman Sea by dust-storms? We know that in times of drought very considerable amounts of Australian dust are occasionally deposited on New Zealand; and orchid seeds are extremely minute. But is it likely that seeds of a dwarf terrestrial orchid from forest gullies of the coastal belt would be caught up and transported by a dust-storm from the dry interior? Another suggestion is that the seeds might have become attached to the feathers of migratory birds. They might; and that is all we can say at present. We do not deny that both birds and dust-storms *may* have been responsible for the appearance in New Zealand of certain orchid species. But is it not remarkable that, although New South Wales has nearly thirty species of *Diuris* on record, not a single species of this genus has been seen in New Zealand? Many species produce seeds quite freely, and some grow in almost any type of country. Or take the genus *Cymbidium*. The North Island of New Zealand should afford conditions suitable at least for *C. canaliculatum* and *C. suave*. Both produce immense quantities of fine, dust-like seeds, easily carried by wind from their arboreal homes. Yet neither occurs in New Zealand. Moreover, if birds and winds have transported orchid seeds successfully across the Tasman Sea, are they doing it still? We do not pretend to answer these questions, but we think they should be faced, and patient research and study will no doubt in time be rewarded by glimpses of the truth. As yet there is no complete explanation of the relation between the two orchid floras. They are explained in part if we accept the theory of the Palaeozelandic continent, for that allows us to believe in an inflow of allied ancestral forms both from north and south; in part perhaps by the agencies of birds and winds; more than this we cannot say. The distribution of orchids may not seem a subject of great importance in itself. But it must be remembered that the Orchidaceae now rank as the largest family of flowering plants; and, in the words of the late Dr. R. S. Rogers, *facile princeps* among Australasian orchidologists, "It is obviously desirable that such a matter as their distribution should be established as accurately and as early as possible. On it may depend, to some extent, the solution of much greater questions concerning the former disposition of land-masses, the origin of our flora, and the true relation of our continent" (and, we may add, of New Zealand) "to other portions of the globe". (*Trans. Roy. Soc. S. Aust.*, xlvii, 1923, p. 322.)

V. A New Orchid Genus for New Zealand.

Aporostylis, n. gen.

Genus monotypicum. Planta terrestris 7–23 cm. alta, plerumque pubescens, tuberibus parvis. Bractea basalis lata, acuminata, bracteae caulinae absentes. Folia duo, inaequalia, fere basalia vel folium minus altius quam folium majus; patentia, breviter petiolata, 3–7 cm. longa; majus magnopere latius quam minus. Flos solitarius, albus vel puniceus, cum sub ovario bractea laxe vaginante. Sepalum dorsale lanceolatum, erectum, circiter 15 mm. longum: sepala lateralia, tam longa quam dorsale: petala similia, paulum breviora. Labellum sessile, prope basem erectum, deinde paulum recurvum, obovatum vel fere orbiculare, apice rotundo et marginibus laevis, circiter 12 mm. longum: discus

cum glandium flavidorum ordinibus duobus. Columna illae *Chiloglottis* instar, sed alis non pone antheram extendentibus.

A monotypic genus created to absorb the anomalous species *Caladenia bifolia* Hook. f. (*Fl. Nov. Zel.*. i, 1853, p. 247). The description of the genus is therefore that of the solitary species, *Aporostylis bifolia* (Hook. f.) Rupp and Hatch.

A terrestrial herb 7–23 cm. high, usually pubescent or even hirsute but occasionally glabrous, with small tubers. General habit that of *Chiloglottis*. Sheathing bract at the base of the stem broad, acuminate; cauline bracts absent. Leaves two, unequal, almost basal or the smaller one above the larger; spreading, shortly petiolate, 3–7 cm. long; the larger leaf usually very much broader than the smaller one but varying from linear-lanceolate to ovate-oblong or almost orbicular, mucronate; the smaller one elliptical to broadly linear, acute. Flower solitary, white or pink, with a loosely-sheathing bract subtending the ovary. Dorsal sepal erect, lanceolate, about 15 mm. long; lateral sepals broad-linear, about as long as the dorsal; petals similar but a little shorter. Labellum sessile, the basal portion erect, then gently recurved, obovate or almost orbicular, with rounded apex and entire margins, about 12 mm. long: disc with two rows of yellow calli extending from the base to about the middle. Column resembling that of *Chiloglottis*, but with wings neither lobed nor produced behind the anther.—*Caladenia bifolia* Hook. f., l.c.; Cheeseman, *Man. N.Z. Fl.*, 1925, p. 360, and *Illustr. N.Z. Fl.*, ii, 1914, t. 197 B; *C. macrophylla* Colenso, *Trans. N.Z. Inst.*, xxvii, 1895, p. 396; *Chiloglottis Traversii* F. Muell., *Veg. Chath. Is.*, 1864, p. 51; *Ch. bifolia* (Hook. f.) Schltr., *Engl. Bot. Jahrb.*, xlv, 1911, p. 383.

Distribution.—New Zealand: North and South Islands, Stewart Island, Chatham and Auckland Islands. Usually alpine or sub-alpine, but descending to sea-level in Stewart and the outlying islands.

"A curious plant, the genus of which is doubtful" (Cheeseman, *Man. N.Z. Fl.*, l.c.). Hooker placed it in *Caladenia*, Mueller removed it to *Chiloglottis*, and Schlechter endorsed this, restoring Hooker's specific name. In either case it exceeds the limits of the generic character, and we believe that the most satisfactory way out of the difficulty is to make it the type of a new genus. It probably originated as an inter-generic cross between ancestral forms of *Chiloglottis cornuta* Hook. f. and *Caladenia Lyallii* Hook. f. Its distribution is very similar, and it is reasonable to suppose that these species, or their ancestral forms, were spread over the ancient Zelandic continent which arose in the Cretaceous period. The affinities of *Aporostylis* with *Chiloglottis* and *Caladenia* are obvious; but the anomalous character of the column distinguishes it from either. The general habit, the occasionally glabrous surface of stem and leaves, and the structure of the column apart from its wings, are all reminiscent of *Chiloglottis*; but the sub-erect, gently recurved labellum with two rows of yellow calli, the broad column wings neither lobed nor produced behind the anther, and the common pubescence of stem and leaves, are more suggestive of *Caladenia*. The great variability of the leaves, and their alternation between the glabrous and pubescent forms, seem to indicate a hybrid origin.